Claims

1. A non-invasive method for detecting a transformed, eucaryotic cell in a mammalian subject, comprising:

administering to the subject a eucaryotic cell transformed with a heterologous gene encoding a fluorescent protein, wherein said subject comprises opaque tissue, and

measuring photon emission through opaque tissue of said subject wherein said photon emission is mediated by fluorescent protein expressed from said heterologous gene.

2. The method of claim 1, wherein the measuring is done using a photodetector device.

3. The method of claim 1, further comprising constructing a photon emission image from said measured photon emission.

4. The method of claim 3, further comprising
acquiring a reflected light image of the subject, and

superimposing said image of photon emission on said reflected light image to form a composite image.

5. The method of claim 2, wherein said measuring is carried out with an intensified charge-coupled photodetector device.

6. The method of claim 2, wherein said measuring is carried out with a cooled charge-coupled photodetector device.

7. The method of claim 1, wherein said measuring is carried out using fiber optic cables.

8. The method of claim 7, wherein said fiber optic cables terminate in a tightly-packed array.

9. The method of claim 7, wherein said fiber optic cables detect light from a limited defined region of the subject.

10. The method of claim 1, wherein said measuring consists of measuring photon emission from within the subject with a photodetector device located outside of the subject.

11. The method of claim 1, wherein photons which make up said photon emission are visible light photons.

12. The method of claim 1, wherein expression of the heterologous gene is regulated by an inducible promoter.

13. The method of claim 1, wherein said eucaryotic cell is a tumor cell.

14. The method of claim 1, wherein said eukaryotic cell is selected from the group consisting of primary culture cells, somatic cells, and lymphatic cells.

15. The method of claim 12, wherein said promoter is a Tet promoter.

16. The method of claim 1, wherein expression of said heterologous gene is mediated by a constitutively active promoter.

17. The method of claim 16, wherein said constitutively active promoter is a CMV or SV40 promoter.

18. The method of claim 1, wherein said fluorescent protein is selected from the group consisting of green fluorescent protein, lumazine, and yellow fluorescent protein.

19. The method of claim 1, wherein a laser is used to excite the fluorescent protein.

20. The method of claim 1, farther comprising:
repeating said measuring at selected time intervals,

wherein said repeating is effective to track localization of the eucaryotic cell in the subject over time.

21. The method of claim 1, further comprising

administering a compound to said subject, and

measuring photon emission from said subject after administration of said compound.

22. The method of claim 21, further comprising:

repeating at selected time intervals said measuring after administration of said compound,

wherein said repeating is effective to track an effect of said compound on a level of said eucaryotic cell in said subject over time.

23. The method of claim 10, wherein the measuring is done using a photodetector device.

24. The method of claim 23, wherein said measuring is carried out with an intensified charge-coupled photodetector device.

25. The method of claim 23, wherein said measuring is carried out with a cooled charge-coupled photodetector device.

26. The method of claim 10, wherein said measuring is carried out using fiber optic cables.

27. The method of claim 10, wherein photons which make up said photon emission are visible light photons.

28. The method of claim 10, further comprising constructing a photon emission image from said measured photon emission.

29. The method of claim 28, further comprising

acquiring a reflected light image of the subject, and

superimposing said image of photon emission on said reflected light image to form a composite image.

30. The method of claim 10, wherein said eucaryotic cell is a tumor cell.

31. The method of claim 10, wherein said eukaryotic cell is selected from the group consisting of primary culture cells, somatic cells, and lymphatic cells.

32. The method of claim 10, wherein said fluorescent protein is selected from the group consisting of green fluorescent protein, lumazine, and yellow fluorescent protein.

33. The method of claim 10, wherein a laser is used to excite the fluorescent protein.

34. The method of claim 10, wherein expression of said heterologous gene is regulated by an inducible promoter.

35. The method of claim 34, wherein said promoter is a Tet promoter.

36. The method of claim 10, wherein expression of said heterologous gene is mediated by a constitutively active promoter.

37. The method of claim 36, wherein said constitutively active promoter is a CMV or SV40 promoter.

38. The method of claim 10, further comprising:

repeating said measuring at selected time intervals,

wherein said repeating is effective to track localization of the eucaryotic cell in the subject over time.

39. The method of claim 10, further comprising:

administering a compound to said subject, and

measuring photon emission from said subject after administration of said compound.

40. The method of claim 39, further comprising:

repeating at selected time intervals said measuring after administration of said compound,

wherein said repeating is effective to track an effect of said compound on a level of said eucaryotic cell in said subject over time.